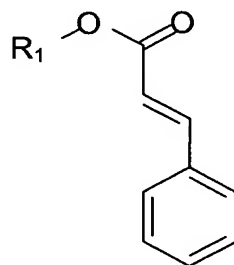


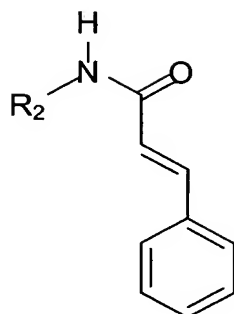
CLAIMS

What is claimed is:

1. A process for the recovery of a multifunctional aromatic compound from a fermentation medium comprising:
  - 5 (a) providing a fermentation medium containing a multifunctional aromatic compound selected from the group consisting of cinnamic acid, para-hydroxycinnamic acid, and para-hydroxystyrene and mixtures thereof;
  - 10 (b) mixing the fermentation medium of (a) with an extractant selected from the group consisting of diisopentyl ether, n-propyl benzoate, 2-undecanone, dibenzyl ether, 2-tridecanone, 2-decanone, 1-phenyl-1-pentanone, methyl decanoate, 1-undecanol, diisobutyl DBE-IB and mixtures thereof, for a time sufficient to allow extraction of the multifunctional aromatic compound into the extractant; and
  - 15 (c) recovering the multifunctional aromatic compound from the extractant.
2. A process according to Claim 1 wherein the extractant is separated from the fermentation medium after the mixing of step (b).
- 20 3. A process according to Claim 1 wherein the recovering of step (c) is accomplished by means of distillation, adsorption by resins, or separation by molecular sieves.
4. A process according to Claim 1 wherein the amount of extractant mixed with the fermentation medium of step (b) is from about
- 25 3% to about 60% by volume.
5. A process according to Claim 2 wherein the multifunctional aromatic compound is derivatized to a derivatized compound in the extractant after separating the extractant from the fermentation medium.
- 30 6. A process according to Claim 5 wherein the multifunctional aromatic compound is cinnamic acid and the derivatized compound is defined by the general formula:

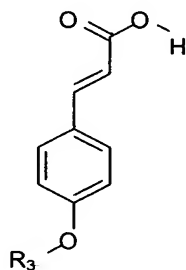


or the general formula:



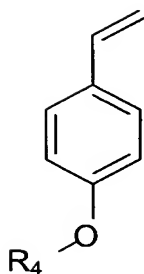
- 5 wherein R1 is selected from the group consisting of allyl, methyl, ethyl, n-butyl or other straight chain alkyl, t-butyl, benzyl, phenyl, hydroxyethyl, vinyl, methoxyethyl and glycidyl; and  
wherein R2 is selected from the group consisting of: H, NH<sub>2</sub>, benzyl, cyclohexyl and phenethyl.

- 10 7. A process according to Claim 5 wherein the multifunctional aromatic compound is para-hydroxycinnamic acid and the derivatized compound is defined by the general formula:



- 15 wherein R3 is selected from the group consisting of: acetoxy, sulfonic acid, a long chain alkyl, ethoxycarbonyl, trimethylsilyl, t-butyldimethylsilyl, diethyl phosphonate, and diethyl phosphate.

8. A process according to Claim 5 wherein the multifunctional aromatic compound is para-hydroxycinnamic acid and the derivatized  
20 compound is defined by the general formula:



wherein R<sub>4</sub> is selected from the group consisting of: methyl, t-butyl, alkyl, silyl ethers, allyl, t-butoxy carbonyl, hydroxyethoxy, acetoxy, formate, glycidyl, benzoate, phenylcarbonate, tetrahydropyran, benzyl, and poly(ethylene oxide).

- 5           9. A process according to Claim 5 wherein the multifunctional aromatic compound is para-hydroxystyrene and the derivatized compound is para-acetoxystyrene.
10. A process according to Claim 2 wherein the extractant is separated from the fermentation medium by use of a gravity settler, a
- 10          centrifuge, or a hydrocyclone.
11. A process for the production of a multifunctional aromatic compound comprising:
  - (a) providing a production host which produces a multifunctional aromatic compound selected from the
  - 15           group consisting of cinnamic acid, para-hydroxycinnamic acid, and para-hydroxystyrene and mixtures thereof;
  - (b) growing the production host in a fermentation medium wherein the production host produces a multifunctional aromatic compound into the fermentation medium to
  - 20           produce a conditioned medium;
  - (c) mixing the fermentation medium of (b) with an extractant selected from the group consisting of diisopentyl ether, n-propyl benzoate, 2-undecanone, dibenzyl ether, 2-tridecanone, 2-decanone, 1-phenyl-1-pentanone, methyl
  - 25           decanoate, 1-undecanol, diisobutyl DBE-IB and mixtures thereof, for a time sufficient to allow extraction of the multifunctional aromatic compound into the extractant;
  - (d) separating the extractant from the fermentation medium; and
  - 30           (e) recovering the multifunctional aromatic compound from the extractant.

12. A process according to Claim 11 wherein the amount of extractant mixed with the fermentation medium of step (c) is from about 3% to about 60% by volume.

5 13. A process for the production of a multifunctional aromatic compound comprising:

- (a) providing a production host which produces a multifunctional aromatic compound selected from the group consisting of cinnamic acid, para-hydroxycinnamic acid, and para-hydroxystyrene and mixtures thereof;
- 10 (b) growing the production host of step (a) in a biphasic growth medium comprising a fermentation medium containing from about 3% to about 60% by volume of an extractant, the extractant selected from the group consisting of diisopentyl ether, n-propyl benzoate, 2-undecanone, dibenzyl ether, 2-tridecanone, 2-decanone, 15 1-phenyl-1-pentanone, methyl decanoate, 1-undecanol, diisobutyl DBE-IB and mixtures thereof; for a time sufficient to allow extraction of the multifunctional aromatic compound into the extractant;
- 20 (c) separating the extractant from the fermentation medium; and
- (d) recovering the multifunctional aromatic compound from the extractant.

25 14. A process according to Claim 13 wherein after step (d) the extractant is optionally added back to the biphasic growth medium.

15. A process according to Claim 13 wherein the fermentation medium after step (c) is optionally added back to the biphasic growth medium.

30 16. A process according to Claim 11 wherein the production host is removed from the fermentation medium prior to mixing the fermentation medium with the extractant.

17. A process according to Claim 16 wherein the production host is removed from the fermentation medium by filtration or centrifugation.

35 18. A process according to either Claim 11 or Claim 13 wherein the extractant is separated from the fermentation medium by use of a gravity settler, a centrifuge, or a hydrocyclone.

19. A process according to either Claim 11 or Claim 13 wherein nutrients are added continuously or periodically to the fermentor.

20. A process according to either Claim 11 or Claim 13 wherein the recovering of step 11(e) or 13(d) is accomplished by means of distillation, adsorption by resins, or separation by molecular sieves.

5 21. A process according to either Claim 11 or Claim 13 wherein the production host is selected from the group consisting of *Escherichia*, *Methylosinus*, *Methylomonas*, *Pseudomonas*, *Streptomyces*, *Corynebacterium*, and *Rhodobacter*.

10 22. A process according to Claim 21 wherein the production host overproduces an amino acid selected from the group consisting of tyrosine and phenylalanine.

23. A process according to Claim 21 wherein the production host is selected from the group consisting of *Escherichia* and *Pseudomonas*.

24. A process according to Claim 23 wherein the production host is *Escherichia coli* or *Pseudomonas putida*.

15 25. A process according to either Claim 11 or Claim 13 wherein the production host is grown in a fermentor selected from the group consisting of a stirred tank fermentor, an airlift fermentor, and a bubble fermentor.

20 26. A process according to either Claim 11 or 13 wherein the multifunctional aromatic compound is derivatized in the extractant after separating the extractant from the fermentation medium.

27. A process according to Claim 26 wherein the multifunctional aromatic compound is para-hydroxystyrene which is derivatized to para-acetoxystyrene.

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